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MONTANA FISH AND GAME DEPARTMENT  
Fisheries Division

November 15, 1965

From: Robert Needham  
To: File  
Subject: Evaluation of malathion spraying at Battle Ridge.

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On July 14, 1965, the Battle Ridge Campground area was sprayed with malathion to control spruce budworms. The spray area consisted of one square mile - (T2N, R7E, S32). Chemical application was made from a helicopter at a rate of 13 ounces per acre. Within the boundaries of the treatment area, malathion was sprayed as uniformly as possible with no attempt to avoid streams.

Brackett Creek and Cache Creek are located near the spray area. Although these creeks were not located within the treatment boundaries, they both receive water from small, intermittent streams which drain the spray area.

Drift samples were obtained to evaluate the effects of spraying upon aquatic invertebrates. Four drift stations were established on the Brackett Creek drainage and two on the Cache Creek drainage. All drift samples were obtained with a one square foot net for five minutes. A summary of the drift sampling schedule and analysis is provided in Table 1.

Malathion application began at approximately 8:00 a.m. Drift collections were begun shortly thereafter, and continued until mid-afternoon, at approximately one and one-half hour intervals.

Drift station No. 1 was located on a small, intermittent stream (Figure 1) within the spray boundary. A marked increase was found in post-spray drift samples, (Table 1) at this station one and one-half hours after spraying. Ephemeroptera (mayflies) exhibited a sharp increase in post-spray samples. Only one mayfly was taken in the first drift sample taken, when spraying began. However, 492 mayflies were taken in the second drift sample. Plecoptera (stoneflies) also increased sharply in post-spray drift samples. No stoneflies were taken when spraying began. However, one and one-half hours after spraying, 63 were taken. This increased to 78 at approximately three hours after spraying. Diptera may have been affected also, but the number of organisms represented is too small for definite conclusions. Other invertebrates present were too scarce to allow evaluation.

Drift station No. 2 was located on the above intermittent stream, about three-fourths of a mile below station No. 1. No obvious increase in drift was noted at this station.

Drift stations No. 3 and 4 were located on the North Fork of Brackett Creek. Post-spray drift samples revealed no apparent change in invertebrate numbers.

Table 1. A summary of the drift sampling schedule and analysis.

Date & Station		Ephem.	Pleco.	Coleop.	Trichop.	Diptera	Misc* Aquatic	Terrest.	Total
"Pre-Spray" 7/7/65									
No. 1		3		3	2	2	4		14
No. 2		10		1	1		3	2	17
No. 3		3	1		3	4	2		13
No. 4		11			3	2	1		17
No. 5		2		1		2	1		6
No. 6		6		6	2	8	2	4	28
Spray Day 7/14/65									
No. 1	8:45 a.m.	1			4	1	1	1	8
	10:03 a.m.	492	63		2	16	2	1	576
	11:34 a.m.	68	78	3	1	9	1	2	162
	2:05 p.m.	5	26		1	5	1		38
No. 2	8:57 a.m.	13		1		2	4	3	23
	10:17 a.m.	9	2	1	1	2	1		16
	11:45 a.m.	6	19		8	3		1	37
	2:17 p.m.	18	2		1	5	4	1	31
No. 3	9:08 a.m.	3	1	1		3			8
	10:29 a.m.	3			1	1			5
	11:55 a.m.	4	2		1	3	2		12
	2:28 p.m.	6		1		3	1	1	12
No. 4	8:20 a.m.	10	12			3	2		27
	10:41 a.m.	6	2	1	1	1	4	1	16
	12:07 p.m.	2			1	2		2	7
	2:41 p.m.	8		3	2	2			15
No. 5	9:37 a.m.	20	1	7	8	6	10		52
	10:56 a.m.	2		1	1	4	2	5	15
	12:21 p.m.	3	4	3	1	1		2	14
	2:52 p.m.			2	1	6	2		11
No. 6	9:48 a.m.	2	1	2	1		5	6	17
	11:19 a.m.	2	1			2	1	11	17
	12:34 p.m.	5	1			9	6		21
	3:08 p.m.	1		1		11	3	2	18

\*Various aquatic organisms taken in small numbers were grouped.



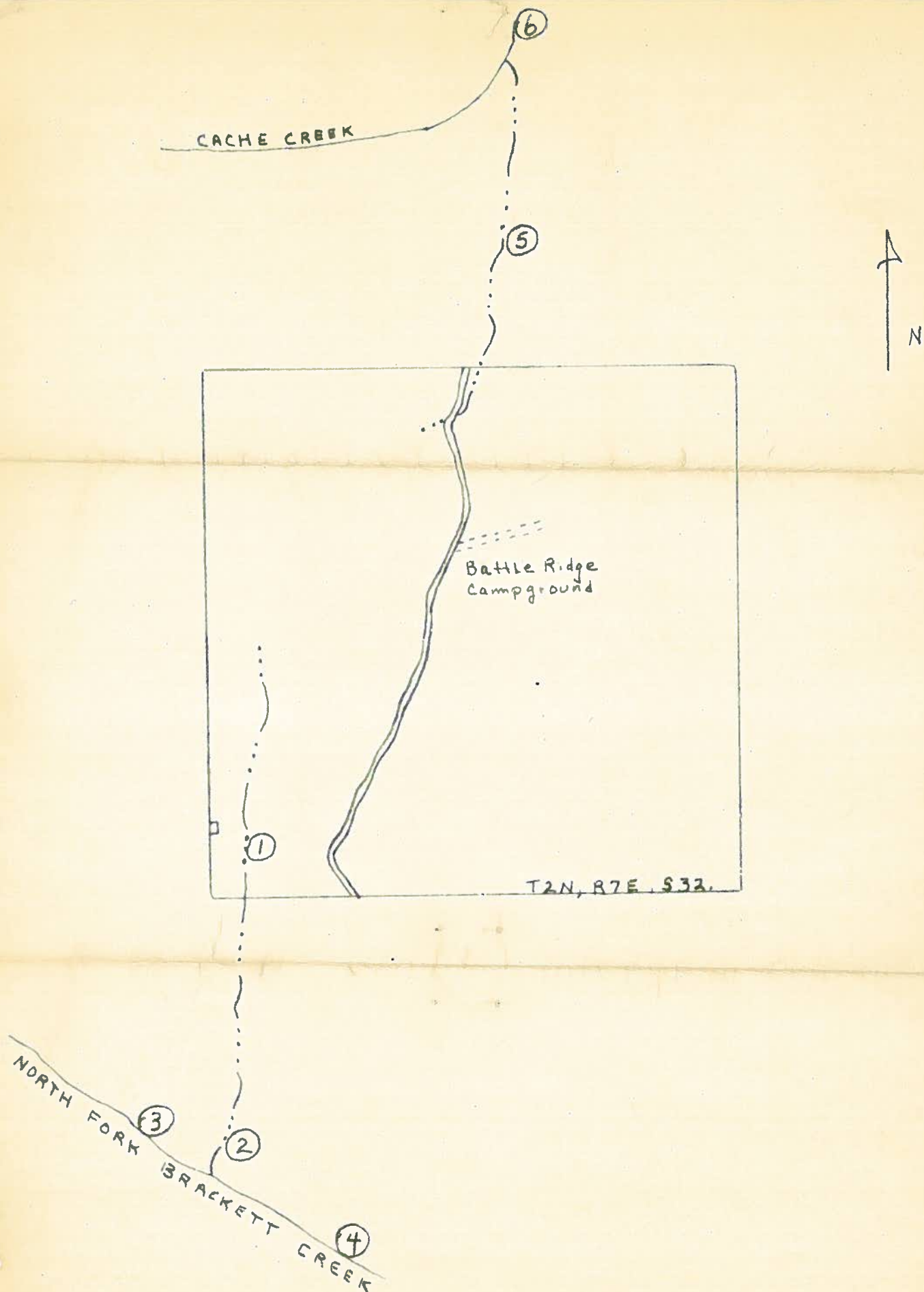


Figure 1. Rough sketch showing the location of drift sample stations.

Station No. 5 was located on an intermittent stream in the Cache Creek drainage, less than one-half mile from the spray area. The first sample taken at Station No. 5, one hour after spraying of this area, revealed higher numbers of organisms than other post-spray samples and a pre-spray sample taken one week prior to treatment. However, the sampling intensity does not permit sufficient information for conclusions.

Drift station No. 6 was located about three-fourths of a mile from the spray boundary. No changes were noted in drift samples at this station.

Henderson and Pickering (1958) reported that DDT was several times more toxic than malathion when testing warm water fish. However, Lewallen and Wilder (1962) reported 100 percent mortalities among rainbow trout fry with 0.50 pound per acre malathion. Parkhurst and Johnson (1955) reported that malathion 500 (contains five pounds of active ingredient per gallon) was decidedly harmful to chinook salmon fingerlings at 0.1 p.p.m. (equivalent to 0.05 pound per acre). In their work they also found that the toxicity of the emulsion was not altered by remaining in the waters up to six days. A note in the Sport Fishing Institute Bulletin (1958) states that malathion proved more harmful to young salmon than DDT, killing half of the test fish at only 0.033 p.p.m. (equivalent to 0.016 pound per acre).

This study indicates that malathion did cause mortalities of aquatic insects where it was applied directly to the stream. The toxic affects on fish have been established by several workers. Therefore, the precautions taken with other pesticides should also be followed in the use of malathion. These are:

1. Avoid direct application to water areas.
2. Provide adequate buffer zones around streams and lakes.
3. Apply only when atmospheric and topographic conditions preclude drift to a stream or lake.
4. Use the smallest possible concentration of malathion effective in controlling spruce budworms.

Literature Cited

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